

COMMUNICATIONS BRIDGE BETWEEN A VEHICLE INFORMATION NETWORK AND A REMOTE SYSTEM

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This is a continuation-in-part of co-pending U.S. application Ser. No.10/082,196, filed Feb. 25, 2002, and entitled VEHICLE COMMUNICATIONS NETWORK ADAPTER.

FIELD OF THE INVENTION

[0002] The present invention relates generally to information communication systems, and more specifically to a communications bridge for providing information exchange between one or more vehicle information networks and one or more remote systems, wherein the communications protocols of the one or more vehicle information networks are different than those of the one or more remote systems.

BACKGROUND OF THE INVENTION

[0003] Motor vehicles include various electronic control computers mounted in the vehicle. The control computers may control various systems and/or subsystems within the vehicle. For example, a control computer may control the fuel system, the transmission, the brakes or the steering mechanism. These control computers are typically coupled to a variety of sensors and/or actuators. In commercial vehicles, control computers are often included that log data regarding usage of the vehicle, such as maximum speed, fuel usage, maximum acceleration, hours of usage, and the like. Such systems may even incorporate a Global Positioning System (GPS) receiver to log where the vehicle has traveled.

[0004] These control computers communicate with each other, and with external service equipment, via one or more vehicle communications networks. Standards for vehicle communications network protocols have been developed and are well known in the art. For example, the Society of Automotive Engineers (SAE) has developed standards concerning the design and use of devices that transmit electronic signals and control information between vehicle components. Some of these standards are SAE J1939, SAE J1850, and SAE J1587/J1708 (SAE J1708 is a specific implementation of an RS-485 communications hardware structure, wherein communications over a J1708 structure may be conducted in accordance with a communications protocol defined by SAE J1587, as is known in the art). Other standards have been developed by other organizations, such as ISO-9141 developed by the International Standards Organization.

[0005] Service equipment has been utilized in the past to diagnose problems with control computers, download information logged by control computers, and upload information to control computers. For example, a control computer may limit the maximum speed or maximum torque of vehicle, and this maximum value may be programmable via a computer-based service tool. In some vehicles, a host of parameters, even the fuel mapping, may be modified via service equipment.

[0006] Service equipment may be generally categorized as a hand-held or stationary device used to communicate

information to and/or from one or more control computers carried by a motor vehicle. A handheld service device is often referred to as a "service tool", and may be used for, among other things, trouble-shooting faults associated with on-board control computers. A typical service tool includes a central processing unit (cpu) and a custom interface circuit to facilitate communication between the cpu and one or more of the control computers in the vehicle. Many service tools are "custom" made, designed to interface only with one or more of the control computers produced by a particular manufacturer, and often only to certain models produced by a particular manufacturer.

[0007] Stationary service equipment is generally used for retrieving data logs, and other more involved tasks, although for many purposes hand-held and stationary service equipment may be interchangeable. Recent designs for stationary service equipment have implemented personal computers (PCs). Current methods for coupling one or more vehicle control computers to a personal computer (PC) require custom, cpu-based interfaces which translate the communication protocols of the one or more vehicle control computers (i.e., SAE J1939 and/or SAE J1587/J1708) into a PC communication standard, such as RS-232 (standard serial) or peripheral computer interface (PCI). These custom interface adapters typically include a PCI interface board mounted in the PC, or an external "pod" which is coupled between the one or more vehicle control computer(s) and the PC.

[0008] Many manufacturers today market handheld computers for non-automotive applications. For example, a personal digital assistant (PDA) is a handheld, pen-based computer that combines personal information manager (PIM) functionality, such as a calendar and an address book, with computing features. Most PDAs are designed to communicate with a "host" computer, generally a personal computer (PC), via either an RS-232 serial port or a Universal Serial Bus (USB) port.

[0009] Such handheld computer systems may be used as a device for assisting in the extraction, display and upload of engine/vehicle information for transfer and analysis. One such system is described in U.S. patent application Ser. No. 09/583,892, titled "Handheld computer based system for collection, display, and analysis of engine/vehicle data", which is assigned to the assignee of the present invention, and the disclosure of which is incorporated herein by reference.

[0010] Both PDAs and PCs typically include, or may be retrofitted with, USB ports. USB ports are much more versatile than standard serial ports for a number of reasons. For example, standard serial ports are "point-to-point", so that only two devices may be connected together for communication via a standard serial link. By contrast, USB provides a multi-point serial link, so that multiple computers may be connected in communication via one data link. As another example, standard serial ports are much slower than USB ports. The maximum attainable speed on a standard serial port is currently in the range of 115 Kb/s. By contrast, high-speed USB is over 400 times faster, attaining transfer rates of 480 Mb/s, and full-speed USB is 100 times faster, attaining data rates of 12 Mb/s.

[0011] However, a computer attached to a multi-point USB serial link must either be configured as a "device", or